1. (Twice Amended) A method for etching a pattern on a workpiece including the steps of:

selecting a workpiece with a hard mask deposited over a layer to be etched, which hard mask is comprised of a reactive metal, the hard mask further defining a first pattern comprising at least one portion having a critical dimension; and

processing the workpiece in a reactor using an etch step and exposing the hard mask to the etch;

whereby a second pattern is etched in the layer corresponding to the first pattern of the hard mask, and the growth of a portion of the second layer pattern is minimized in the critical dimension.

2. (Previously Amended) The method of claim 1 wherein:

said selecting step includes selecting a workpiece having a hard mask which hard mask comprises of one of titanium, aluminum, and tantalum.

3. The method of claim 1 including the step of:

exposing the hard mask to a stream of oxidizing gas in the reactor prior to or during said etch step.

4. The method of claim 1 including the step of:

exposing the hard mask to an oxidizing stream comprising of one of oxygen, nitrogen, fluorine, boron, and carbon gas, and any combination of oxygen, nitrogen, fluorine, boron, and carbon gas, in the reactor prior to or during said etch step.

5. (Previously Amended) The method of claim 1 wherein :

said selecting step includes selecting a workpiece with a lithographic layer covering the hard mask.

6. The method of claim 1 wherein:

said selecting step includes selecting a substrate having a hard mask which is readily oxidizable.

7. The method of claim 1 wherein:

said selecting step includes selecting a substrate with a hard mark, which hard mask is comprised of a metal with a low sputtering yield.

8. The method of claim 1 including the step of:

exposing the hard mask to a stream of oxidizing gas in the reactor prior to or during said etch step in order to oxidize the surface of the hard mask and thereby slow down an etch rate of the hard mask.

9. The method of claim 1 wherein:

said selecting step includes selecting a hard mask (1) on which has been or (2) on which can be developed at least one of an oxide, nitride, fluoride, boride and carbide.

10. (Once Amended) A method for etching a pattern on a workpiece including the steps of:

selecting a workpiece with a hard mask deposited over a layer to be etched, which hard mask is comprised of a reactive metal;

processing the workpiece in a reactor using an etch step and exposing the hard mask to the etch; and

providing energy to the reactor in order to increase a rate of oxidation of the hard mask in order to slow down the rate of erosion of the hard mask.

11. (Previously Amended) The method of claim 10 wherein:

said step of providing energy causes the substrate in the reactor to be heated to a temperature in the range of from about 80°C to about 300°C.

12. The method of claim 1 including the step of:

oxidizing the hard mask either prior to or during the processing step.

13. (Twice Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

selecting a workpiece with a hard mask deposited over a layer to be etched, wherein said hard mask has a low sputter yield and a low reactivity to the etch chemistry of an etch process; and

processing the workpiece in a reactor using the said etch chemistry in order to etch the layer and exposing the hard mask to the etch chemistry;

whereby features are created under the hard mask from the etch of the layer, the hard mask providing for minimal growth of the width of the features beyond the hard mask.

14. (Previously Amended) The method of claim 13 wherein:

said selecting step includes selecting a workpiece wherein said hard mask is comprised of a reactive metal.

15. (Previously Amended) The method of claim 13 wherein:

said selecting step includes selecting a workpiece having a hard mask which comprises at least one of titanium, aluminum, tantalum, tungsten, cobalt, and molybdenum.

16. The method of claim 13 including the step of:

exposing the hard mask to a stream of oxidizing gas in the reactor prior to or during said processing step.

17. The method of claim 13 including the step of:

exposing the hard mask to a stream consisting of one of oxygen, nitrogen, fluorine, boron, and carbon and any combination of oxygen, nitrogen, fluorine, boron and carbon.

18. (Previously Amended) The method of claim 13 wherein :

said selecting step includes selecting a workpiece with a lithographic layer covering the hard mask.

19. The method of claim 13 wherein:

said selecting step includes selecting a substrate having a hard mask which is readily oxidizable.

20. The method of claim 13 including the step of:

exposing the hard mask to a stream of oxidizing gas in the reactor prior to or during said etch step in order to oxidize the surface of the hard mask, and thereby slow down an etch rate of the hard mask.

21. The method of claim 13 wherein:

said selecting step includes placing a hard mask (1) which has been or (2) which can be oxidized.

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22. (Once Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

selecting a workpiece with a hard mask deposited over a layer to be etched, wherein said hard mask has a low sputter yield and a low reactivity to the etch chemistry of an etch process;

processing the workpiece in a reactor using the said etch chemistry in order to etch the layer and exposing the hard mask to the etch chemistry; and

providing energy to the reactor in order to increase a rate of oxidation of the hard mask in order to slow down the rate of erosion of the hard mask.

23. (Previously Amended) The method of claim 22 wherein :

said step of providing energy causes a workpiece in the reactor to be heated to a temperature in the range of from about 80°C to about 300°C.

24. The method of claim 13 including the step of:

oxidizing the hard mask either prior to or during the processing step.

25. (Twice Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

selecting a workpiece with a hard mask deposited over a layer to be etched, which hard mask is comprised of at least one of titanium, titanium compounds, aluminum, aluminum compounds, tantalum, tantalum compounds, tungsten, tungsten compounds, cobalt, cobalt compounds, molybdenum, and molybdenum compounds; and

processing the workpiece in the reactor using an etch step and exposing the hard mask to the etch step.

26. (Twice Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

depositing on a substrate workpiece and over a layer to be etched a hard mask comprising at least one of a reactive metal, an oxide of a reactive metal, a nitride of a reactive metal, a fluoride of a reactive metal, a boride of a reactive metal, and a carbide of a reactive metal; and

processing the workpiece in the reactor using an etch step and exposing the hard mask to the etch step.

27. The method of claim 26 wherein:

said hard mask is selected from a material having a low sputter yield.

28. (Twice Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

depositing on a workpiece and over a layer to be etched a hard mask, wherein said hard mask has at least one of a low sputter yield and a low reactivity to the etch chemistry of an etch process; and

processing the workpiece in the reactor using the said etch chemistry in order to etch the layer and exposing the hard mask to the etch chemistry.

29. (Twice Amended) A method for minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

depositing on a workpiece and over a layer to be etched, a hard mask which comprises at least one of titanium, titanium compounds, aluminum, aluminum compounds, tantalum, tantalum compounds, tungsten, tungsten compounds, cobalt, cobalt compounds, molybdenum, and molybdenum compounds; and

processing the workpiece in the reactor using an etch step and exposing the hard mask to the etch step.

30. (Twice Amended) A method of minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

selecting a workpiece with a hard mask consisting of one of a reactive metal, an oxide of a reactive metal, a nitride of a reactive metal, a fluoride of a reactive metal, a boride of a reactive metal, and a carbide of a reactive metal, and a compound comprising any combination of an oxide, a fluoride, a nitride, a carbide, and a boride of a reactive metal, deposited over a layer to be etched; and

processing the workpiece in the reactor using an etch step and exposing the hard mask to the etch step.

31. The method of claim 30 wherein:

said selecting step includes selecting a substrate having a hard mask which consists of one of titanium, titanium compounds, aluminum, aluminum compounds, tantalum, tantalum compounds, tungsten, tungsten compounds, cobalt, cobalt compounds, molybdenum, and molybdenum compounds.

32. (Previously Amended) The method of claim 30 including the step of:

said selecting step includes selecting a hard mask consisting of a reactive metal; and

exposing the hard mask to a stream comprising of at least one of oxygen, nitrogen, fluorine, boron, carbon, and ions or radicals of oxygen, ions or radicals of nitrogen, ions or radicals of fluorine, ions or radicals of boron, and ions or radicals of carbon in the reactor prior to or during said etch step.

33. The method of claim 30 wherein:

said selecting step includes selecting a substrate with a hard mask, which hard mask is comprised of a metal with a low sputtering yield.

34. (Once Amended) A method of minimizing growth of the width of features etched from a layer on a workpiece including the steps of:

selecting a workpiece with a hard mask consisting of one of a reactive metal, an oxide of a reactive metal, a nitride of a reactive metal, a fluoride of a reactive metal, a boride of a reactive metal, and a carbide of a reactive metal, and a compound comprising any combination of an oxide, a fluoride, a nitride, a carbide, and a boride of a reactive metal, deposited over a layer to be etched;

processing the workpiece in the reactor using an etch step and exposing the hard mask to the etch step; and

providing energy to the reactor in order to increase a rate of oxidation of the hard mask in order to slow down the rate of erosion of the hard mask.

35. The method of claim 13 wherein:

said selecting step includes selecting a substrate wherein said hard mask comprises at least one of a reactive metal, an oxide of a reactive metal, a nitride of a reactive metal, a fluoride of a reactive metal, a carbide of a reactive metal, a boride of a reactive metal or some combination of a reactive metal.

36. The method of claim 1 including the step of:

using the etched substrate to fabricate one of a semiconductor chip, a magnetic head, and a flat panel display.

37. The method of claim 1 wherein:

said selecting step includes a hard mask comprised of at least one of a reactive metal and a compound of a reactive metal; and

said selecting step further includes selecting a hard mask comprised of at least one of titanium, aluminum, tantalum, tungsten, cobalt, molybdenum, copper, nickel, iron, and

compounds of at least one of titanium, aluminum, tantalum, tungsten, cobalt, molybdenum, copper, nickel, and iron.

38. The method of claim 1 wherein:

said selecting step includes a hard mask comprised of at least one of a reactive metal and a compound of a reactive metal, and said compound comprises at least one of an oxide, a nitride, a fluoride, a boride, and a carbide of a reactive metal, and any combination of an oxide, a nitride, a fluoride, a boride, and a carbide of a reactive metal.

39. The method of claim 1 wherein:

said selecting step includes a hard mask comprised of at least one of a reactive metal and a compound of a reactive metal, and said compound comprises any compounds formed by exposing a reactive metal to ions or radicals of at least one of oxygen, nitrogen, fluorine, boride, carbon, and any combination of said gases.

40. The method of claim 1 wherein:

said selecting step includes a hard mask comprised of at least one of a reactive metal and a compound of a reactive metal; and

said selecting step includes selecting a hard mask consisting of one of titanium, aluminum, tantalum, tungsten, cobalt, molybdenum, copper, iron, nickel, and compounds of one of titanium, aluminum, tantalum, tungsten, cobalt, molybdenum, copper, iron, and nickel.

41. The method of claim 38 wherein the processing step operates at one of below atmospheric pressure, atmospheric pressure, and above atmospheric pressure.

Remarks

The above Amendments and these Remarks are in reply to the Office Action mailed February 14, 2001. In the Office Action, the Examiner rejected all claims. Reconsideration of the rejections and consideration of the new claims is requested.

I. Claim Rejections under 35 U.S.C. §112

The Examiner rejected claims 1, 13, 25, 26, 28, 29, and 30 under 35 U.S.C.§ 112 as being indefinite. These claims have been amended. Applicants therefore respectfully request that the rejection with respect to claims 1, 13, 25, 26, 28, 29, and 30 be withdrawn.